SECTION 15180

HEATING AND COOLING PIPING

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Edit to suit project.
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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe materials, fittings, valves and accessories for heating water, chilled water, condenser water, and refrigerant.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Catalog data on pipe materials, fittings, valves, and accessories.

2. Installation instruction for valves and accessories.

PART 2 PRODUCTS

2.1 PRODUCT SUBSTITUTION

A. Refer to Section 01630.

2.2 HEATING WATER PIPING, BURIED (SERVICE UP TO 250°F)

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: AWS A5.8 BCuP silver braze.

3. Coating: See Part 3, Corrosion Control.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welded type, standard wall.

2. Joints: Welded.

3. Coating: See Part 3, Corrosion Control.

2.3 HEATING WATER PIPING, ABOVE GROUND (SERVICE UP TO 250°F)

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: Solder, ASTM B32, Grade 95TA.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welding type or malleable threaded type,

ASME B16.3.

2. Joints: Welded for pipe size over 2 1/2 in. and above, threaded for pipe sizes up to 2 in.

2.4 CHILLED WATER PIPING, BURIED

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: AWS A5.8 BCuP silver braze.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welded type, standard wall.

2. Joints: Welded.

3. Coating: See Part 3, Corrosion Control

C. Ductile Iron Pipe: AWWA C151.

1. Fittings: AWWA C110, ductile or gray iron.

2. Joints: AWWA C1111, bell and spigot with rubber gaskets.

3. Coating: Pipe and fitting, cement mortar-lined with bituminous outside coating.

D. PVC Pipe: ASTM D1785, schedule [40][80].

1. Fittings: PVC, ASTM D2466 (schedule 40), or ASTM D2467 (schedule 80).

2. Joints: ASTM D2855, solvent weld.

2.5 CHILLED WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: Solder, ASTM B32, Grade 95TA.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welded type, standard wall or malleable threaded type, ASME B16.3.

2. Joints: Welded for pipe size 2 1/2 in. and above, threaded for pipe sizes up to 2 in.

C. Pipe: Black steel, ASTM A53, standard wall, grooved for Victaulic fittings and couplings.

1. Fittings: Victaulic, ductile or malleable iron, service rating 35°F to 230°F at 300 psig working pressure. Use long radius elbows (1 1/2 D) and flexible couplings.

2.6 CONDENSER WATER PIPING, BURIED

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: AWS A5.8 BCuP silver braze.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welded type, standard wall.

2. Joints: Welded.

3. Coating: See Part 3, Corrosion Control.

C. Ductile Iron Pipe: AWWA C151.

1. Fittings: AWWA C110, ductile or gray iron.

2. Joints: AWWA C1111, bell and spigot with rubber gaskets.

3. Coating: Pipe and fitting, cement mortar-lined with bituminous outside coating.

E. PVC Pipe: ASTM D1785, schedule [40][80].

1. Fittings: PVC, ASTM D2466 (schedule 40), or ASTM D2467 (schedule 80).

2. Joints: ASTM D2855, solvent weld.

2.7 CONDENSER WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: Solder, ASTM B23, Grade 95TA.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welded type, standard wall or malleable threaded type, ASME B16.3.

2. Joints: Welded for pipe size 2 1/2 in. and above, threaded for pipe sizes up to 2 in.

C. Pipe: Black steel, ASTM A53, standard wall, grooved for Victaulic fittings and couplings.

1. Fittings: Victaulic, ductile or malleable iron, service rating 35°F to 230°F at 300 psig working pressure. Use long radius elbows (1 1/2 D) and flexible couplings.

2.8 REFRIGERATION PIPING

A. Copper Tubing: ASTM B280, Type ACR hard-drawn or annealed, factory cleaned and sealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joint: AWS A5.8 BcuP silver braze. Purge piping with nitrogen during brazing operation.

2.9 EQUIPMENT DRAINS AND OVERFLOWS

A. Pipe: Galvanized steel, ASTM A53, standard wall.

1. Fittings: Galvanized cast iron, or ASTM B16.3 malleable iron.

2. Joints: Threaded or grooved mechanical couplings.

B. Copper Tubing: ASTM B88, hard drawn.

1. Fittings: ASTM B16.22, wrought copper, solder joint.

2. Joints: Solder, ASTM B32, Grade 95TA.

2.10 UNIONS, FLANGES, AND COUPLINGS

A. Unions for pipe 2 in. and under.

1. Copper Tubing: ASME B16.22, Class 150, wrought copper, solder joint.

2. Ferrous Piping: ASME B16.39, Class 150, malleable iron treaded.

B. Flanges for pipe over 2 in.

1. Copper Tubing: ASME B16.5, Class 150, bronze.

2. Ferrous Piping: Forged Steel, ASME B16.5, Class 150.

3. Gaskets: 1/16 in. thick preformed neoprene.

C. Mechanical Couplings

1. Vitaulic, ductile or malleable, service rating 35°F to 230°F at 300 psig, flexible type.

D. Dielectric Connections

1. Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.11 Valves

A. Gates Valves up to 2 in.

1. Manufacturer: Nibco, Series 111.

2. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, hand wheel, inside screw, solid wedge disc, solder or threaded ends.

B. Gate Valves over 2 in.

1. Manufacturer: Nibco, Series 617-0.

2. MSS SP-70, Class 150, iron body, bronze trim, outside screw and yoke, hand wheel solid wedge disc, flanged ends.

C. Globe Valves up to 2 in.

A. Manufacturer: Nibco, Series 211.

B. MSS SP-80, Class 150 bronze body, bronze trim, hand wheel, bronze disc, solder or threaded ends.

D. Globe Valves over 2 in.

A. Manufacturer: Nibco F-7188.

B. MSS SP-85, Class 125, iron body, bronze trim, hand wheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends.

E. Ball Valves up to 2 in.

A. Manufacturer: Nibco, Series 585-70.

B. MSS SP-110, 600 psi non-shock cold water, bronze, two piece body, chrome plated brass ball, full port, Teflon seats and stuffing box ring, blowout proof stem, lever handle, solder or threaded ends.

F. Butterfly Valves over 2 in.

1. Manufacturer: Nibco, Series LD 2000.

2. MSS SP-67, 200 psi non-shock cold water, ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, lug style, extended neck, lever handle, for use between Class 125/150 flanges.

G. Grooved Valves.

1. Manufacturer: Victaulic.

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Specify grooved valves (ball, butterfly, and check) when using grooved piping system (mechanical joints.)

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2.12 SWING CHECK VALVES

A. Sizes up to 2 in.

1. Manufacturer: Nibco 433 Series.

2. MSS SP-80, Class 150 bronze, horizontal swing, y-pattern, renewable seat and disc. Solder or threaded ends to suit piping.

B. Sizes over 2 in.

1. Manufacturer: Nibco F-918.

2. MSS SP-80, Class 125 iron body, fluid to 450°F, bolted bonnet, horizontal swing, renewable seat and disc, flanged.

2.13 SILENT CHECK VALVES

A. Sizes up to 2 in.

1. Manufacturer: Nibco 480 Series.

2. Class 125 bronze, in-line left type, spring actuated, TFE seat and disc, solder or threaded ends to suit piping.

B. Sizes over 2 in.

1. Manufacturer: Nibco F-910.

2. Class 125, iron body, fluid to 200°F, renewable seats and disc, spring actuated, flanged.

2.14 BALANCING VALVES

1. Manufacturer: Bell and Gossett, Circuit Setter Model CB.

2. Bronze body, brass ball construction with differential read out ports and drain/purge ports, 300 psig rating at 250°F, with memory stop features and calibrated nameplate.

3. Size [ ] in., NPT threaded ends.

2.15 PRESSURE GAUGES

A. Manufacturer: Reotemp Instruments.

B. B40.1, 1 % accuracy, minimum 4 in. dial, glycerine filled, phosphor bronze bourden tube, 1/4 in. NPT brass bottom connection, steel or phenolic case.

2.16 THERMOMETER

A. Manufacturer: Reotemp G45UR.

B. Gas actuated, mercury free, 4 1/2 in. phenolic case, all angle direct mount, range [0/120°F][60/120°F][20/240°F] with standard well, insert length to suit piping.

2.17 STRAINERS

A. Sizes up to 2 in.

1. Manufacturer: Watts Series 777.

2. Bronze body, Y-type, screwed ends, 20 mesh stainless steel screen, for water service-WOG (non-shock) 400 psi at 210°F.

B. Sizes above 2 in.

1. Manufacturer: Watts Series 77F-D.

2. Class 125, cast iron body, Y-type, B16.1, flanged ends, stainless steel standard screen, for water service-WOG (non-shock) 200 psi at 150°F.

2.18 TEST PLUGS (PETE'S PLUG)

A. 1/4 in. NPT, brass body, neoprene core, 1000 psig rating, complete with sealing cap and gasket, to receive 1/8 in. O.D. probe.

2.19 REFRIGERATION SPECIALTIES

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Specify required refrigeration specialties, i.e., filter-driers, solenoid valves, expansion valves; moisture and liquid indicators, check valve, shut-off valves, etc., to suit project.

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2.20 EXPANSION/FLEXIBLE CONNECTIONS

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Specify expansion joints, pump connectors, flexible connectors, etc., to suit project.

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PART 3 EXECUTION

3.1 EXAMINATION

A. Do not install underground piping when bedding is wet or frozen.

B. Verify that excavations are to required grade.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

3.3 WATER LINE COVER

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Refer to Civil Drawing ST3211 for trenching detail.

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A. Provide cover, bedding, warning tape, and [tracing wire] per trench details and below grade piping details. Refer to Section 02225, Trenching.

3.4 INSTALLATION

A. Install heating water, chilled water, condenser water in conformance with ASME B31.9. Install refrigeration piping in conformance with ASME B31.5.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Matching of bronze fittings with steel or copper pipe does not require dielectrics.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom and neither interfere with use of space nor take more space than necessary.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide access where valves and other equipment are not exposed. See Section [08310].

H. Install valves with stems upright or horizontal, not inverted.

I. Sleeve and caulk pipes passing through partitions, walls and floors. See Section [15060].

J. Pipe relief valves to nearest floor drain. Install a union after each relief valve.

K. Slope water piping and arrange to drain at low points.

L. Flush and chemically treat HVAC water piping systems in accordance with Section 15185.

M. Pressure test piping system in accordance with Section 15992.

N. Label piping system and install underground warning tape in accordance with Section 15190.

O. Insulate piping system in accordance with Section 15250.

P. Support piping system in accordance with Section [15060].

Q. Seal openings around pipe in fire-related walls or floors with UL-approved fire retardant mastic. See Section [07840].

R. Provide automatic air vents in cooling and heating water closed piping systems at high point.

S. Install chrome-plated steel excutcheons for insulated pipes at finished surfaces.

T. Arrange refrigeration piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 1/2 in. in 10 ft.

U. Flood refrigerant piping system with nitrogen when brazing.

V. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

W. Provide replaceable cartridge filter-dryers, with isolation valves and bypass with valve.

X. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

Y. Provide external equalizer piping on expansion valves with refrigerant distributor connected to vaporizer.

Z. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

AA. Fully charge completed system with refrigerant after testing.

3.5 Corrosion Control

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Contact Robert Keown, JCNNM Utilities at 667-6191, or Jerry Gonzales, F-4 at 5-2612 for cathodic protection requirements when using black steel pipe below grade. NOTE: Factory pre-insulated piping systems (e.g., Rovanco Corp, 505-344-7100) may be used as a replacement for corrosion control and/or field insulation.

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A. Cathodic Protection

1. Furnish and install cathodic protection system as noted on the Drawings.

A. Pipe Coating (black steel pipe below grade)

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Specify a field wrap pipe coating (Polyken) or a factory coating suitable for the operating temperature of the piping system. Field wrap joints and fittings.

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END OF SECTION